ECON 423 - IS/LM Lab

Objectives

This lab uses Excel to increase your understanding of the IS/LM Model.

Goals

1. Work with IS/LM Model
2. Understand a simple dynamic macroeconomic model
3. Use Excel as a simulation tool

Model - Book

- Consumption Function: $C = \alpha_1 + \beta_1(Y - T)$
- Disposable Income: $Y_d = Y - T$
- Investment Function: $I = \alpha_2 + \beta_2 Y - \gamma_2 R$
- Import Function: $M = \alpha_3 + \beta_3 Y$
- Income Identity: $Y \equiv C + I + G + X - M$
- Money Demand Function: $M_D = \alpha_4 + \beta_4 Y - \gamma_4 R$
- Money Market Equilibrium $M_D \equiv M_S$

Model Parameterized - Book

- Consumption Function $C = 2.0 + 0.7 Y_d$
- Investment Function: $I = 3.0 + 0.12Y - 0.20R$
- Income Identity: $Y \equiv C + I + G + X_M$
- Money Demand Function: $M_D = 4.0 + 0.2Y - 0.4R$
- Money Market Equilibrium $M_D \equiv M_S$

- Exogenous Variables: $G = 12$, $T = 10$, $M_S = 12$ $K_{t-1} = 142$, $LF = 36$

Model - Lab

- Consumption Function: $C = \alpha_1 + \beta_1(Y - T)$
- Taxes $T = t_0 + t_1 Y$
- Disposable Income: $Y_d = Y - t_0 - t_1 Y$
- Investment Function: $I = \alpha_2 + \beta_2 Y - \gamma_2 R$
- Income Identity: $Y \equiv C + I + G$
- Money Demand Function: $M_D = \alpha_4 + \beta_4 Y - \gamma_4 R$
- Money Market Equilibrium $M_D \equiv M_S$

Model Parameterized - Lab

- Consumption Function $C = 2.0 + 0.7 Y_d$
- Taxes $T = 1.0 + 0.15 Y$
- Disposable Income: $Y_d = Y - 1.0 - 0.15 Y$
- Investment Function: $I = 3.0 + 0.12 Y - 0.20 R$
- Income Identity: $Y \equiv C + I + G$
- Money Demand Function: $M_D = 4.0 + 0.2 Y - 0.4 R$
- Money Market Equilibrium $M_D \equiv M_S$

IS Curve

- Spending:

$$\begin{aligned} SP &= C + I + G \\ SP &= \alpha_1 + \beta_1(Y - t_0 - t_1 Y) + \alpha_2 + \beta_2 Y - \gamma_2 R + G \\ SP &= \alpha_1 + \beta_1 Y - \beta_1 t_0 - \beta_1 t_1 Y + \alpha_2 + \beta_2 Y - \gamma_2 R + G \end{aligned}$$

- IS Curve

$$\begin{aligned} Y = SP &= \alpha_1 + \beta_1 Y - \beta_1 t_0 - \beta_1 t_1 Y + \alpha_2 + \beta_2 Y - \gamma_2 R + G \\ \gamma_2 R &= \alpha_1 + \beta_1 Y - \beta_1 t_0 - \beta_1 t_1 Y + \alpha_2 + \beta_2 Y + G - Y \\ \gamma_2 R &= \alpha_1 + \alpha_2 - \beta_1 t_0 + G + \beta_1 Y - \beta_1 t_1 Y + \beta_2 Y - Y \\ \gamma_2 R &= \alpha_1 + \alpha_2 - \beta_1 t_0 + G + (\beta_1 - \beta_1 t_1 + \beta_2 - 1)Y \\ \gamma_2 R &= \alpha_1 + \alpha_2 - \beta_1 t_0 + G + (\beta_1(1 - t_1) + \beta_2 - 1)Y \\ \gamma_2 R &= \alpha_1 + \alpha_2 - \beta_1 t_0 + G - (1 - \beta_1(1 - t_1) - \beta_2)Y \\ R &= \frac{\alpha_1 + \alpha_2 - \beta_1 t_0 + G}{\gamma_2} - \frac{1 - \beta_1(1 - t_1) - \beta_2}{\gamma_2} Y \end{aligned}$$

$$\begin{aligned} R &= \sigma_1 - \sigma_2 Y \\ \sigma_1 &= \frac{\alpha_1 + \alpha_2 - \beta_1 t_0 + G}{\gamma_2} \\ \sigma_2 &= \frac{1 - \beta_1(1 - t_1) - \beta_2}{\gamma_2} \end{aligned}$$

LM Curve

- Money Demand Function: $M_D = \alpha_4 + \beta_4 Y - \gamma_4 R$
- Money Market Equilibrium $M_D \equiv M_S$
- LM Curve

$$\begin{aligned} \frac{M_D}{P} = \frac{M_s}{P} = \frac{M}{P} &= \alpha_4 + \beta_4 Y - \gamma_4 R \\ R &= \frac{1}{\gamma_4}\frac{M}{P} + \frac{\alpha_4}{\gamma_4} + \frac{\beta_4}{\gamma_4} Y \end{aligned}$$

$$R = -\lambda_1 \frac{M}{P} + \lambda_2 + \lambda_3 Y$$

$$\begin{aligned} \lambda_1 &= \frac{1}{\gamma_4} \\ \lambda_2 &= \frac{\alpha_4}{\gamma_4} \\ \lambda_3 &= \frac{\beta_4}{\gamma_4} \end{aligned}$$

Reduced Form Equations

$$\begin{aligned}
R &= -\lambda_1 \frac{M}{P} + \lambda_2 + \lambda_3 Y \ (\mathsf{LM}) \\
R &= \sigma_1 - \sigma_2 Y \ (\mathsf{IS}) \\
-\lambda_1 \frac{M}{P} + \lambda_2 + \lambda_3 Y^* &= \sigma_1 - \sigma_2 Y^* \\
\lambda_3 Y^* + \sigma_2 Y^* &= \sigma_1 + \lambda_1 \frac{M}{P} - \lambda_2 \\
(\lambda_3 + \sigma_2) Y^* &= \sigma_1 + \lambda_1 \frac{M}{P} - \lambda_2 \\
Y^* &= \frac{\lambda_1}{(\lambda_3 + \sigma_2)} \frac{M}{P} + \frac{\sigma_1 - \lambda_2}{(\lambda_3 + \sigma_2)}
\end{aligned}$$

Income	Y^*	$=$	$\frac{\lambda_1}{\lambda_3+\sigma_2}\frac{M}{P} + \frac{\sigma_1-\lambda_2}{\lambda_3+\sigma_2}$
Interest Rates	R^*	$=$	$\sigma_1 - \sigma_2 Y^*$
Consumption	C^*	$=$	$\alpha_1 - \beta_1 t_0 + \beta_1(1-t_1)Y^*$

Parameter Values

$\alpha_1 = 2.0$	$\beta_1 = 0.7$	
$t_0 = 1.0$	$t_1 = 0.15$	
$\alpha_2 = 3.0$	$\beta_2 = 0.12$	$\gamma_2 = 0.20$
$\alpha_4 = 4.0$	$\beta_4 = 0.2$	$\gamma_4 = 0.4$
$\lambda_1 = 2.5$	$\lambda_2 = 10$	$\lambda_3 = 0.5$
$\sigma_1 = 81.5$	$\sigma_2 = 1.425$	
$G = 12$	$M = 12$	$P = 1$

Experiments

- Expansionary Fiscal Policy
- Contractionary Fiscal Policy
- Expansionary Monetary Policy
- Contractionary Monetary Policy
- Tax Rate Cut

Dynamics in Model?

- Must model the change in some variable
- Prices?
- Capital Stock?